Importation of Fresh Pepper Fruit, *Capsicum annuum* from Chile into the United States

Qualitative, Pathway-Initiated Pest Risk Assessment

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A. Introduction

This pest risk assessment was prepared by Plant Protection and Quarantine (PPQ) of the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) to examine plant pest risks associated with the importation of fresh pepper fruit, *Capsicum annuum* from Chile into the United States. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high, medium or low as opposed to numerical terms such as probabilities or frequencies.

International plant protection organizations (*e.g.*, North American Plant Protection Organization (NAPPO), International Plant Protection Convention (IPPC) of the United Nations Food and Agriculture Organization (FAO)) provide guidance for conducting pest risk analyses. The methods we used to initiate, conduct, and report this plant pest risk assessment are consistent with guidelines provided by NAPPO and FAO. Our use of biological and phytosanitary terms (*e.g.*, introduction, quarantine pest) conforms with the *NAPPO Compendium of Phytosanitary Terms* (NAPPO 1995) and the *Definitions and Abbreviations* (Introduction Section) in *International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis* (FAO 1995).

Pest risk assessment is one component of an overall pest risk analysis. The *Guidelines for Pest Risk Analysis* provided by FAO (1995) describe three stages in pest risk analysis. This document satisfies the requirements of FAO Stages 1 (initiation) and 2 (risk assessment).

The Food and Agriculture Organization (FAO, 1995) defines "pest risk assessment" as "Determination of whether a pest is a quarantine pest and evaluation of its introduction potential". "Quarantine pest" is defined as "A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled" (FAO, 1995; NAPPO, 1995). Thus, pest risk assessments should consider both the likelihood and consequences of introduction of quarantine pests. Both issues are addressed in this qualitative pest risk assessment.

This document presents the findings of our qualitative plant pest risk assessment. We have not described in detail our assessment methods or the criteria we used to rate the various risk elements. Details of our methodology and rating criteria can be found in our "template" document: ***Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments*** (USDA-PPQ, 1995); to obtain a copy of our template, contact the individual named on the front of this risk assessment.

B. Risk Assessment

1. Initiating Event: Proposed Action

This pest risk assessment is commodity-based, and therefore "pathway-initiated"; we initiated the assessment in response to the request for PPQ authorization to allow imports of a particular commodity presenting a potential plant pest risk. In this case, the importation of fresh pepper fruit from Chile into the U.S. is a potential pathway for introduction of plant pests. Quarantine 56 (7 CFR §319.56) provides a general regulatory authority for importation of fruits and vegetables.

2. Assessment of Weediness Potential of *Capsicum annuum*

Phase I Consider whether the species is new to or not widely prevalent in the United States (exclude plants grown under PPQ permit in approved containment facilities) ***Capsicum annuum* is a familiar crop grown commercially and residentially throughout the U.S.**

Phase II Answer Yes or No to the following questions:

Is the species listed in:

YES / NO *Geographical Atlas of World Weeds* (Holm, 1979)
YES / **NO** *World's Worst Weeds* (Holm, 1977)
YES / **NO** *Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act* (Gunn & Ritchie, 1982)
YES / **NO** *Economically Important Foreign Weeds* (Reed, 1977)
YES / **NO** Weed Science Society of America list (WSSA, 1989)
YES / NO Is there any literature reference indicating weediness (*e.g.*, *AGRICOLA*, *CAB*, *Biological Abstracts*, *AGRIS*; search on "species name" combined with "weed"). (D'Arcy, 1973)

Phase III Conclusion:

IF: 1. The species is widely prevalent in the United States and the answer to all of the questions is **no**...

THEN: proceed with the pest risk assessment.

✔ 2. The species is widely prevalent in the United States and the answer to **one** or more of the questions is **yes**...

THEN: proceed with the pest risk assessment and incorporate findings regarding weediness into the Risk Elements described below.

3. The species is new to or not widely prevalent in the United States and the answer to all of the questions is **no**...

THEN: proceed with the pest risk assessment

4. The species is new to or not widely prevalent in the United States and the answer to **one or more** of the questions is **yes**...

THEN: Consult authority under the Federal Noxious Weed Act for listing plant species as a noxious weed, and consider the advisability of performing a pest-initiated pest risk assessment on the plant species.

Holm, et al include *Capsicum annuum* L. in the *Geographical Atlas of World Weeds* as a

weed of unknown importance in Australia and India. *C. annuum* var. *aviculare*, bird pepper, is considered a weed in Missouri. Commercial pepper (*Capsicum*) is currently imported from many countries other than Chile. Commercial pepper from Chile is unlikely to present any increased weed potential than the pepper currently produced in the United States. Therefore *Capsicum* fruit from Chile will not be further considered as a weed.

3. Previous Risk Assessments on *Capsicum* from Central and South America.

Country/year:	**Mitigation/Pest Risk management:**
Belize, 1992	approved. Commercial shipments only from Medfly free area.
Colombia, 1988	denied. No acceptable treatment for Medfly.
Guatemala, 1988	denied. " " " "
Honduras, 1984	denied. " " " "
Panama, 1984	denied. " " " "
Chile, 1983	denied. No treatment for *Rhagoletis "ochraspis"*.
Ecuador, 1982	denied. No acceptable treatment for Medfly.
Surinam, 1973	approved through North Atlantic ports
Costa Rica, 1971	denied. No acceptable treatment for Medfly.
Nicaragua, 1971	denied. " " " "
Venezuela, 1971	denied. " " " "

4. Pest List: Pests Associated with *Capsicum* in Chile

Tables 1 and 2 show our pest list for Chilean *Capsicum annuum*. We generated the list after review of the information sources listed in USDA-PPQ (1995). The list includes potential pests associated with the commodity or plant species. The pest list includes limited information on the distribution of each pest, pest-commodity association, interception records, and regulatory history. While preparing this list, we assumed that all Quarantine 56 conditions would be in effect: only the specified commodity (*i.e.*, sound, export quality fruits), free of leaves, soil, or other plant matter, would be shipped with the fruit. Plant parasitic nematodes were not included in the list of pathogens as they are not pests of pepper fruit.

Table 1. Scientific Name of Arthropod Pests

Pest	Distribution[1]	Comments[2]	References
Agrotis bilitura (Guenée) (Noctuidae)	CL	k	Prado, 1991 Poole, 1989
Agrotis experta (Walker) (Noctuidae)	CL	n,k	Prado, 1991 Poole, 1989
Agrotis ipsilon (Hufnagle) (Noctuidae)	CL,US	a,c,k	Prado, 1991 Hodges, 1983
Agrotis lutescens (Blanchard) (Noctuidae)	CL	n,k	Prado, 1991 Poole, 1989

Table 1. Scientific Name of Arthropod Pests			
Pest	**Distribution[1]**	**Comments[2]**	**References**
Agrotis malefida (Guenée) (Noctuidae)	CL,US	c,k	Prado, 1991 Hodges, 1983 Poole, 1989
Agrotis subterranea (F.) (Noctuidae)	CL,US	c,k	Prado, 1991 Hodges, 1983 Poole, 1989
Aphis craccivora Koch (Aphididae)	CL,US	c,k,*	Prado, 1991 Blackman & Eastop, 1985
Aphis gossypii Glover (Aphididae)	CL,US	a,c	Prado, 1991 Hill, 1987 McGuire, 1967 Blackman & Eastop, 1985
Apterothrips apteris (Daniel) (Thripidae)	CL,US	k	Prado, 1991 Nakahara, 1995
Atrichonotus taeniatulus (Berg) (Curculionidae)	CL,US	k	Prado, 1991 O'Brien & Wibner, 1982
Auculops lycopersici (Masse) (Eriophyidae)	CL,US	k	Prado, 1991
Aulacorthum circumflexum (Buckton) (Aphididae)	CL,US	k	Prado, 1991 Blackman & Eastop, 1985
Aulacorthum solani (Kaltenbach) (Aphididae)	CL,US	a,c,k	Prado, 1991 Blackman & Eastop, 1985 Hill, 1987
Autographa biloba (Steph.) (Noctuidae)	CL,US	c,k	Prado, 1991
Blapstinus punctulatus Sol. (Tenebrionidae)	CL	n,k,x	Prado, 1991
Bracyhcaudus helichrysi (Kaltenbach) (Aphididae)	CL,US	c,k,*	Prado, 1991 Blackman & Eastop, 1985

Table 1. Scientific Name of Arthropod Pests			
Pest	**Distribution[1]**	**Comments[2]**	**References**
Bryotropha galbanella (Zeller) (Gelechiidae)	CL	k	Prado, 1991
Capitophorus eleagni Del Guercio (Aphididae)	CL,US	c,k	Prado, 1991 Blackman & Eastop, 1985
Ceratitis capitata (Wiedemann) (Tephritidae)	CL[3],US[3]	n,h,z	Prado, 1991 Metcalf, 1993 7 CFR 301.78 7 CFR 318.13 7 CFR 319.56(2j)
Ceratophysella armata (Nic.) (Hypogastruridae)	CL	b	Prado, 1991
Conoderus rufangulus Gillet (Elateridae)	CL	n,k,x	Prado, 1991
Copitarsia consueta (Walker) (Noctuidae)	CL	n,k	Prado, 1991
Copitarsia naenioides (Butler) (Noctuidae)	CL	k	Prado, 1991
Copitarsia sp. (Noctuidae)	CL	k,n,x	PPQ (interceptions)
Delia platura (Meigen) (Anthomyiidae)	CL,US	c,k	Prado, 1991
Deroceras reticulatum (Müller) (Limacidae)	CL,US	a,c	Prado, 1991
Empoasca curveola Oman (Cicadellidae)	CL	k	Prado, 1991
Epicauta pilme (Mol.) (Meloidae)	CL	a,k	Prado, 1991
Epitrix sp. (Chrysomelidae)	CL	n,k,x,*	Prado, 1991
Eurylomata picturata Blanchard (Miridae)	CL	k	Prado, 1991 Carvalho, 1959
Graphognathus leucolorum (Boh.) (Curculionidae)	Cl,US	c,k	Prado, 1991 O'Brien & Wibner, 1982
Haplothrips leucanthemi Schrank (Phlaeothripidae)	CL,US	c,k	Prado, 1991 Nakahara, 1995
Helicoverpa gelotopoeon (Dyar) (Noctuidae)	CL	n,k	Prado, 1991
Helicoverpa zea (Boddie) (Noctuidae)	CL,US	c,z$_e$	Prado, 1991

Table 1. Scientific Name of Arthropod Pests			
Pest	**Distribution[1]**	**Comments[2]**	**References**
Heliothis virescens (F.) (Noctuidae)	CL,US	c,k	Prado, 1991
Helix aspersa (Müller) (Helicidae) (Mollusk)	CL,US	h,n	Prado, 1991
Hyadaphis foeniculi (Pass.) (Aphididae)	CL,US	c,k	Prado, 1991 Blackman & Eastop, 1985
Hyles euphorbiarum (Guer. & Perch) (Sphingidae)	CL	a,k	Prado, 1991 Hodges, 1996
Hymenia recurvalis (F.) (Pyralidae)	CL,US	c,k	Prado, 1991 Hodges, 1983
Keiferia lycopersicella (Walsingham) (Gelechiidae)	CL,US	c,k	Prado, 1991 Hodges, 1983
Leptoglossus chilensis (Spin.) (Coreidae)	CL	n,k	Prado, 1991
Lineodes integra Zeller (Pyralidae)	CL,US	a,c,z	Prado, 1991
Liriomyza huidobrensis (Blanchard) (Agromyzidae)	CL,US	g,k	7 CFR 319.74 Prado, 1991 Spencer, 1990 Spencer & Steyskal, 1986
Liriomyza quadrata (Malloch) (Agromyzidae)	CL	k	Prado, 1991 Spencer, 1990 Spencer & Steyskal, 1986
Listroderes costirostris obliquus Klug. (Curculionidae)	CL,US	c,k	Prado, 1991 Wibmer & O'Brien, 1986, Tappan, 1974
Listroderes subscinctus Boh. (Curculionidae)	CL	n,k	Prado, 1991
Lonchaeidae, sp. of (Lonchaeidae)	CL	b, 1 interception in baggage	PPQ (interceptions).
Loxostege similalis (Guenée) (Pyralidae)	CL	k	Prado, 1991 Hodges, 1983

Table 1. Scientific Name of Arthropod Pests			
Pest	**Distribution[1]**	**Comments[2]**	**References**
Lygeus alboornatus Blanchard (Lygaeidae)	CL	n,k	Prado, 1991 Slater, 1964
Macrosiphum euphorbiae (Thomas) (Aphididae)	CL,US	a,c,k	Prado, 1991 Metcalf, 1993 Blackman & Eastop, 1985
Manduca sexta (Joh.) (Sphingidae)	CL,US	a,c,k	Prado, 1991 Hodges, 1983
Medonia deromecoides Sch. (Elateridae)	CL	k	Prado, 1991
Myzus persicae (Sulzer) (Aphididae)	CL,US	a,c,k	Prado, 1991 Blackman & Eastop, 1985
Naupactus xanthographus (Germ.) (Curculionidae)	CL	g,k,x	Prado, 1991
Neosilba sp. (Lonchaeidae)	CL	b	Prado, 1991 White, 1992 Gonzalez, 1989
Nezara viridula (L.) (Pentatomidae)	CL,US	c, k	Prado, 1991
Pantamorus cervinus (Boh.) (Curculionidae)	Cl,US	c,k	Prado, 1991
Penthaleus major (Duges) (Penthaleidae)	CL,US	k	Prado, 1991 Jeppson, et al, 1975
Peridroma clerica (Butler) (Noctuidae)	CL	k	Prado, 1991
Peridroma saucia (Hübner) (Noctuidae)	CL,US	a,c,k	Prado, 1991 Metcalf, 1993 Hodges, 1983
Phenacoccus solenopsis Tinsley (Pseudococcidae)	CL,US	c,k	Prado, 1991 McKenzie, 1967
Phthorimaea operculella (Zeller) Gelechiidae	CL,US	c,k	Prado, 1991 Hodges, 1983

Table 1. Scientific Name of Arthropod Pests			
Pest	**Distribution[1]**	**Comments[2]**	**References**
Platyaspistes glaucus Fahraeus (Curculionidae)	CL	k	Prado, 1991 Wibmer & O'Brien, 1986 Jackson, 1987
Premnotrypes latithorax (Pierce) (Curculionidae)	CL	k	Prado, 1991 Wibmer & O'Brien, 1986
Pseudaletia impuncta (Guenée) (Noctuidae)	CL	n,k	Prado, 1991 PPQ intercept.
Pseudaletia punctulata (Blanchard) (Noctuidae)	CL	n,k	Prado, 1991 Poole, 1989
Pseudococcus affinis (Maskell) (Pseudococcidae)	CL,US	c,k	Prado, 1991 McKenzie, 1967
Pseudococcus longispinus (Targ.) (Pseudococcidae)	CL,US	c,z_e	Prado, 1991 McGuire, 1967
Pseudoplusia includens Walker = (*Phytometra oo* (Cramer)) (Noctuidae)	CL,US	k	Prado, 1991 Poole, 1989
Rachiplusia nu (Guenée) (Noctuidae)	CL	k	Prado, 1991 Poole, 1989
Rhagoletis conversa (Bréthes) (Tephritidae)	CL	k	White, 1992 Foote, 1981
Rhagoletis nova (Schiner) (Tephritidae)	CL	k	Prado, 1991 Foote, 1981
Rhagoletis tomatis Foote (Tephritidae)	CL	k	Prado, 1991 Foote, 1981
Rhigopsidius tucumanus Heller (Curculionidae)	CL	k	Prado, 1991 Wibmer & O'Brien, 1986

Table 1. Scientific Name of Arthropod Pests			
Pest	**Distribution[1]**	**Comments[2]**	**References**
Rhopalosiphum rufiabdominalis (Sasaki) (Aphididae)	CL,US	c,k	Prado,1991 Blackman & Eastop, 1985
Russelliana solanicola Tutthill (Psyllidae)	CL	k	Prado, 1991 Burkhardt, 1987
Scrobipalpula absoluta (Meyerick) (Gelechiidae)	CL	k	Prado, 1991
Smynthurodes betae Westwood (Aphididae)	CL,US	c,k	Prado, 1991 Blackman & Eastop, 1985
Spodoptera eridania (Cramer) (Noctuidae)	CL,US	c,k	Prado, 1991
Spodoptera frugiperda (Smith) (Noctuidae)	CL,US	c,k	Prado, 1991
Symmetrischema tangolias (Gyen) (Glechiidae)	CL,US	a,k	Prado, 1991 Hodges, 1995
Syncharina lineiceps (Spin.) (Cicadellidae)	CL	k	Prado, 1991
Syngrapha gammoides (Blanchard) (Noctuidae)	CL	k	Prado, 1991
Tetranychus cinnabarinus (Boisduval) (Tetranychidae)	CL,US	a,c	Prado, 1991 Hill, 1987, Smiley, 1995
Tetranychus urticae (Koch) (Tetranychidae)	CL,US	a,c,k	Prado, 1991 Jeppson et al, 1975
Thrips tabaci Lind. (Thripidae)	CL,US	a,c,k	Prado, 1991 Hill, 1987
Trialeurodes vaporariorum (Westwood) (Aleyrodidae)	CL,US	a,c,k	Prado, 1991 Hill, 1987
Xerophloea viridis (F.) (Cicadellidae)	CL,US	k	Prado, 1991

[1]Distribution: CL= Chile, US= United States

[2]Code:

a - Pest mainly associated with plant part other than commodity
b - Not likely to be a primary plant pest
c - Listed in U.S. Department of Agriculture (PPQ) catalogue of pest interceptions as non-actionable

g- Quarantine pest; pest has limited distribution in the U.S. and is under official control as follows: pest listed by name in PPQ's pest dictionary, official quarantine action may be taken on this pest when intercepted on this commodity.

h- Quarantine pest; pest has limited distribution in the U.S. and is under official control as follows:(1) pest listed by name in USDA's pest dictionary, official quarantine action may be taken on this pest when intercepted on this commodity and, (2) pest is a program pest (there is an official Federal or recognized State program for control of this pest beyond its being listed in the pest dictionary as actionable.)

k - Not specifically listed for host, but reported from other hosts in same plant genus/family.

n - Listed in the PPQ catalogue of intercepted pests as actionable

x - Multiple interception records exist

z_i - Internal feeder: Pest is known to commonly attack or infect fruit and it would be reasonable to expect the pest may remain with the fruit during processing and shipping

z_e - External feeder: Pest is known to commonly attack or infect fruit and it would be reasonable to expect the pest may remain with the fruit during processing and shipping

*- Pest vectors a quarantine significant virus however the virus is vectored in a nonpersistent manner and the vector would not be expected to remain viruliferous throughout shipping.

[3] *Ceratitis capitata* has been detected in both Chile and the United States. Whenever *C. capitata* is detected in either country, a quarantine is establshed and an eradication program is implemented. *C. capitata* is a quarantine pest iin both countries.

Table 2. Pest List-Chilean Pepper (*Capsicum* spp.): Pathogens

Scientific Name[1] and Disease Name	Dist.[2]	Code[3]	Reference
Fungi			
Phytophthora capsici Leonian Phytophthora blight	SA,US	c,f	Black *et al.* 1991
Rhizoctonia solani Kühn Damping off and root rot	CL,US	c,f	Black *et al.* 1991
Sclerotium rolfsii Sacc. Stem rot	CL,US	c,f	Black *et al.* 1991
Stemphylium solani G. F. Weber Gray leaf spot	CL,US	f	Black *et al.* 1991
Verticillium albo-atrum Reinke & Berthier Verticillium wilt	CL,US	c,f	Black *et al.* 1991
Verticillium dahliae Kleb. Verticillium wilt	CL,US	c,f	Black *et al.* 1991
Mycoplasma-like organisms (MLOs)			
Aster Yellows MLO Potato purple top wilt	SA,US	f	Hooker, 1981
Viruses			
Alfalfa mosaic	SA,US	f	Brunt *et al.* 1989
Andean potato mottle comovirus	SA(BR, PE)	d	CMI, 1979
Beet curly top	SA, US	f	Smith *et al.*, 1992

Table 2. Pest List-Chilean Pepper (*Capsicum* spp.): Pathogens			
Scientific Name[1] and Disease Name	**Dist.[2]**	**Code[3]**	**Reference**
Cucumber mosaic	CL, US	f	Brunt *et al.*, 1989
Peru tomato potyvirus	SA(PE)	d	CMI , 1982
Potato Y	SA,US	f	Brunt *et al.*, 1989
Tobacco mosaic or tomato mosaic	CL,US	f	Brunt *et al.*, 1989
Tobacco etch	SA(VZ) US	f	Brunt *et al.*, 1989
Tomato bushy stunt virus	SA(AR) US	f	CMI, 1971
Tomato spotted wilt	CL, US	f	Brunt *et al.*, 1989; CMI, 1978

[1] Scientific names of fungi and bacteria as listed in Farr *et al.* 1989 and Bradbury, 1986.

[2] Distribution: CL= Chile, SA= Countries in South America but not Chile [AG=Argentina, BR=Brazil, PE=Peru, VZ=Venezuela], US= United States.

[3] Pest list codes:

c - Listed in the U.S. Department of Agriculture (PPQ) catalogue of pest interceptions as non- actionable
d - Commodity is unlikely to serve as inoculum source because vector is unknown or does not feed on commodity and/or seed transmission has not been reported in Capsicum spp. (viruses)

f - Pest occurs in the U.S. and is not currently subject to official restrictions and regulations (i.e. not listed as actionable or non-actionable, and no official control program)

The possibility that the above viruses could be vectored by any of the above arthropods was investigated. A number of the species on the arthropod list have been reported as vectors of viruses, however few of these are quarantine significant. Three notable exceptions are *Epitrix* sp. and the aphids *Aphis craccivora* and *Brachycaudus helichrysi*. *Epitrix* vectors Andean potato latent virus which is present in Chile but not reported from the U.S. *Epitrix* is an inefficient vector of APLV, but little else is known about the virus-vector relationship. The transmission is probably not persistent. The two aphid species are reported to be vectors of plum pox virus which is present in Chile. It probably is not very likely, however, that the aphids would acquire PPV from infected *Prunus* then feed on peppers, particularly the fruit, and remain with the fruit and viruliferous until shipped to the U.S. PPV is transmitted nonpersistently which by definition means that aphids remain viruliferous for very short periods of time.

5. List of Quarantine Pests

Our list of quarantine pests for commercial shipments of *Capsicum annuum* fruit from Chile is provided below. Should any of these pests be intercepted on commercial (or any other) shipments of *C. annuum*, quarantine action may be taken.

Viruses:
Andean potato mottle comovirus
Peru tomato potyvirus

Mollusk:
Helix aspersa (Müller) (Helicidae)

Arthropods:
Agrotis bilitura (Guenée) (Noctuidae)
Agrostis experta (Walker) (Noctuidae)
Agrotis lutescens (blanchard) (Noctuidae)
Blapstinus punctulatus Sol. (Tenebrionidae)
Bryotropha galbanella (Zeller) (Gelechiidae)
Ceratitis capitata (Wiedemann) (Tephritidae)
Conoderus rufangulus gillet (Elateridae)
Copitarsia consueta (Walker) (Noctuidae)
Copitarsia naenioides (Butler) (Noctuidae)
Copitarsia sp. (Noctuidae)
Empoasca curveola Oman (Cicadellidae)
Epicauta pilme (Mol.) (Meloidae)
Epitrix sp. (Chrysomelidae)
Eurylomata pictuata Blanchard (Miridae)
Helicoverpa gelotopoeon (Dyar) (Noctuidae)
Hyles euphorbiarum (Guer. & Perch.) (Sphingidae)
Leptoglossus chilensis (Spin.) (Coreidae)
Liriomyza huidobrensis (Blanchard) (Agromyzidae)
Liriomyza quadrata (Malloch) (Agromyzidae)
Listroderes subscinctus Boh. (Curculionidae)
Lonchaeidae sp. of (Lonchaeidae)
Loxostege similalis (Guenée) (Pyralidae)
Lygus alboornatus Blanchard (Lygaeidae)
Medonia deromecoides Sch. (Elateridae)
Naupactuis xanthographus (Germ.) (Curculionidae)
Neosilba sp. (Lonchaeidae)
Peridroma clerica (Butler) (Noctuidae)
Platyaspistes glaucus Fahraeus (Curculionidae)
Premnotrypes latithorax (Pierce) (Curculionidae)
Pseudaletia impuncta (Guenée) (Noctuidae)
Pseudaletia punctulata (Blanchard) (Noctuidae)
Rachiplusia nu (Guenée) (Noctuidae)
Rhagoletis conversa (Bréthes) (Tephritidae)
Rhagoletis nova (Schiner) (Tephritidae)
Rhagoletis tomatis Foote (Tephritidae)
Rhigopsidius tucumanus Heller (Curculionidae)
Russelliana solanicola Tutthill (Psyllidae)

Scrobipalpula absoluta (Meyerick) (Gelechiidae)
Syncharina lineiceps (Spin.) (Cicadellidae)
Syngrapha gammoides (Blanchard) (Noctuidae)

6. Quarantine Pests Likely to Follow Pathway (Quarantine Pests Selected for Further Analysis)

We analyzed in detail only those quarantine pests that can reasonably be expected to follow the pathway, *i.e.,* be included in commercial shipments of *Capsicum annuum* fruit (see PPQ, 1995 for selection criteria). Only quarantine pests selected for further analysis are subjected to steps 7-9 below.

From this list, the only pest which is most likely to travel with the fruit, and from previous assessments, has the greatest potential for economic damage, is *Ceratitis capitata. Capsicum* is a known host of Medfly as evidenced from literature; from world PPQ pest interception records and from official pest rearing at Beltsville, MD. Previous assessments (1983) which cite *Rhagoletis* "*ochraspis*" as a pest of concern in *Capsicum* are doubtful. Foote (1981) places *R. ochraspis* in synonymy with *R. tomatis* Foote and *R. tomatis* is recorded from tomato and not pepper. White (1992) does not list any *Rhagoletis* as attacking *Capsicum.*

Other pests, e.g. *Blapstinus punctulatus* and *Conoderus rufangulus* are not expected to be associated with the fruit. However, PPQ has records of these pests as occasional hitchhiker contaminants with other Chilean commodities. These pests and other hitchhiking pests (pests which are dislodged from the *Capsicum* plant during harvest or from post harvest infestations which follow packing or processing) are routinely detected by visual inspections.

7. Economic Importance: Consequences of Introduction

We rate each pest with respect to potential economic importance based on five biological features referred to here as Risk Elements (RE). Details of the five RE's , the rating criteria are provided in PPQ (1995). Our ratings for these five RE's are shown in Table 6.

The cumulative (Total) score for Risk Elements 1-5 (*i.e.*, and therefore the "Consequences of Introduction Risk Rating") is considered to be a biological indicator of the potential destructiveness of the pest.

Table 6: Risk Rating: Consequences of Introduction

Pest	Climate/ Host	Host Range	Dispersal	Eco-nomic	Environ-mental	Risk Rating
Ceratitis capitata	high	high	high	high	high	high

8. Likelihood of Introduction

The undesirable outcome being considered is the introduction of a quarantine pest. The two general components of a pest risk assessment are estimates of the consequences and likelihood of introduction. Risk Elements 1-5 (above) focus on the consequences of introduction. This element presents our

method for assessing the likelihood of introduction. For qualitative pest risk assessments the assessment is qualitative as shown below. There are two separate components. First, an estimate is made concerning the amount of commodity likely to be imported; the result is a risk rating (2) that applies to the commodity and country in question and is the same for all quarantine pests considered. And second, nine biological features concerning the pest and their interactions with the commodity are considered. The resulting risk ratings are specific to each pest.

Table 7: Risk Rating: Likelihood of Introduction

Pest	Quantity of commodity imported annually	Likelihood survive postharvest treatment	Likelihood survive shipment	Likelihood not detect at port of entry	Likelihood moved to suitable habitat	Likelihood find suitable host
Ceratitis capitata	med	high	high	high	high	high

With these risk ratings, we rate the cumulative likelihood of introduction of each of these quarantine pests with shipments of fresh Chilean *Capsicum annuum* fruit to be **high risk.** The cumulative risk rating for introduction is considered to be an indicator of the likelihood that a particular pest would be introduced.

9. Conclusion: Pest Risk Potential and Phytosanitary Measures

The overall risk posed by a particular pest depends on both the consequences and likelihood of introduction (see PPQ, 1995). Our rating of the overall pest risk potential (PRP) for each quarantine pest selected for further analysis is shown in Table 8.

Table 8: Pest Risk Potential, Quarantine Pests, Chilean Capsicum Fruit

Pest	Pest risk potential
Ceratitis capitata	high

For pests receiving a PRP risk rating of high, such as *Ceratitis capitata*, we strongly recommend specific phytosanitary measures, port-of-entry inspection is not considered sufficient to provide phytosanitary security. This pest risk assessment is the first stage of the risk analysis and constitutes a primary tool for the rounds of risk management and risk communication to follow. However, there is an established Medfly free zone (CFR 319.56(2j)) and an established preclearance program in Chile for most fruits and vegetables exported to the United States.

C. References

Black, L. L., S. K. Green, G. L. Hartman and J. M. Poulos. 1991. Pepper diseases: A field guide. Asian Vegetable Research and Development Center. Taipei. 98 pp.

Blackman, R.L. and V.F. Eastop. 1985. Aphids on the World's Crops an Identification Guide. John Wiley & Sons. 466 pp.

Bradbury, J. F. 1986. Guide to Plant Pathogenic Bacteria. CAB International Mycological Institute. Kew, Surrey, England.. 332 p.

Brunt, A., K. Crabtree and A. Gibbs. 1990. Viruses of tropical plants. C.A.B. International and A.C.I.A.R. Wallingford, Oxon,UK. 707 p.

Burkhardt, D. 1987. Jumping Plant Lice (Homoptera: Psylloidea) of the Temperate Neotropical Region. Part 1: Psyllidae (subfamilies Aphalarinae, Rhinocolinae and Aphalaroidinae). Zool. J.of the Linnean Soc. V89. pp 299-392.

Carvalho, J.C. 1959. A Catalogue of the Miridae of the World. Vol. XLVIII, Part IV, subfamily Mirinae. 384 pp.

CMI, 1971. C.M.I./A.A.B. Descriptions of Plant Viruses No. 69. Tomato Bushy Stunt Virus. Commonwealth Agricultural Bureaux, England.

CMI, 1978. C.M.I. Distribution maps of plant diseases No. 8. Tomato spotted wilt virus. Commonwealth Agricultural Bureaux, England.

CMI, 1979. C.M.I./A.A.B. Descriptions of Plant Viruses No. 203. Andean potato mottle virus. Commonwealth Agricultural Bureaux, England.

CMI, 1982. C.M.I./A.A.B. Descriptions of Plant Viruses No. 255 Peru tomato virus. Commonwealth Agricultural Bureaux, England.

Code of Federal Regulations. Mediterranean Fruit Fly Quarantine and Regulations. 7 CFR 301.78

Code of Federal Regulations. Cut Flower Quarantine. 7 CFR 319.74

Code of Federal Regulations. Fruits and Vegetables Quarantine. 7 CFR 319.56(2j)

Code of Federal Regulations. Hawaiian Fruits & Vegetables Quarantine. 7 CFR 318.13.

D'Arcy, W.G. and W.H. Esbaugh. 1973. The name for the common bird pepper. Phytologia, 25(6), p 350.

FAO, 1995. International Standards for Phytosanitary Measures. Section I, Import Regulations. (Draft Standard). Guidelines for Pest Risk Analysis. Secretariat of the International Plant Protection Convention, FAO, Rome.

Farr, D. F., G. F. Bills, G. P. Chamuris and A. Y. Rossman.. 1989. Fungi on plants and plant products in the United States. American Phytopathological Society, St. Paul, Minnesota. 1252 pp.

Feldman, J. M. and O. Gracia. 1977. Pepper severe mosaic virus: a new potyvirus from pepper in Argentina. Phytopath. Z. 89:146-160.

Foote, R.H. 1981. The genus Rhagoletis Loew south of the United States (Diptera: Tephritidae). USDA Tech. Bull. 1607. 75 pp.

Gonzalez, R.H. 1989. Insectos y Acaros de importancia Agrícola y Cuarentenaria en Chile. Universidad de Chile. 310 pp.

Gunn, C.R. and C. Ritchie. 1982. 1982 Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act. (unpublished).

Henry, T.J. 1988. Catalog of the Heteroptera or True Bugs, of Canada and the Continental United States. E.J. Brill. 958 pp.

Hill, D.S. 1987. Agricultural Insect pests of Temperate Regions and Their Control. Cambridge University Press. 659 pp.

Hodges, R.W, et al. 1983. Checklist of the Lepidoptera of America North of Mexico. E. W. Classey Ltd. and the Wedge

Hodges, R. W. 1995 & 1996. Personal communications. Research Scientist. Systematic Entomology Laboratory, USDA-ARS. Washington. D.C.

Entomological Research Foundation. 284 pp.

Holm, L.G., D.L. Plucknett, J.V. Pancho and J.P. Herberger. 1977. The World's Worst Weeds. University of Hawaii Press, Honolulu.

Holm, L.G., J.V. Pancho and J.P. Herberger and D.L. Plucknett. 1979. A Geographical Atlas of World Weeds. John Wiley and Sons, New York.

Hooker, W.J., (ed.) 1981. Compendium of Potato Diseases. American Phytopathological Society, St. Paul, MN. 125 pp.

Jackson, S.D., 1987. Observations on the biology of *Platyaspistes glaucus* Farhaeus, 1840 (Coleoptera: Curculionidae). Revisita chileana de Entomologia. 15: 85-87.

Jeppson, L.R. et al, 1975. Mites Injurious to Economic Plants. U. Of Calif. Press. 614 pp.

McGuire, J.U. Jr, and B.S. Crandall. 1967. Survey of Insect Pests and Plant Diseases of Selected Food Crops of Mexico, Central America and Panama. USDA, ARS. 157 pp.

McKenzie, H.L. 1967. Mealybugs of California. U. Calif. Press, Berkeley. 526 pp.

Metcalf, R.L. and R. A. Metcalf, 1993. Destructive and Useful Insects. Their Habits and Control. 5th ed. McGraw-Hill, Inc.

Nakahara, S. 1995. Personal Communication. Research Scientist, Systematic Entomology Laboratory, USDA-ARS, Beltsville, MD.

NAPPO/FAO. 1991. NAPPO/FAO glossary of phytosanitary terms. NAPPO Secretariat, Ottawa, Ontario, Canada.

O'Brien, C.W. and G.J. Wibner. 1982. Annotated checklist of the weevils (Curculionidae sensu lato) of North America, Central America, and the West Indes (Coleoptera:Curculionoidae). American Entomological Institute. 382 pp.

Poole, R.W. 1989. Lepidopterorum Catalogus (new Series). Fascicle 118, Noctuidae. E. J. Brill, 1314 pp.

PPQ, 1995. List of Intercepted Plant Pests.

Prado, E.C. 1991. Artropodos y sus Enemigos naturales Asociadoes a Plantas Cultivadas en Chile. Instituto de Investigaciones Agropecuarias Bol. Tech. No. 169. Santiago, Chile. 207 pp.

Reed, C.F. 1977. Economically Important Foreign Weeds. Agriculture Handbook No. 498

Slater, J.A. 1964. A Catalogue of the Lygaeidae of the World. University of Conn., Storrs. 1668 pp.

Smiley, R.L. 1995. Personal Communication. Research Scientist, Systematic Entomology Laboratory, USDA-ARS, Beltsville, MD.

Smith, I.M., McNamara, D.G., Scott, P.R. and Harris, K.M., eds. 1992. Quarantine Pests or Europe. EPPO and CAB. International, Oxon, UK. 1032 pp.

Spencer, K.A. and G. C. Steyskal. 1986. Manual of the Agromyzidae (Diptera) of the United States. USDA Agric. Handbook. No. 638, 478 pp.

Spencer, K.A. 1990. Host Specialization in the World Agromyzidae (Diptera). Kluwer Academic Publishers. 444 pp.

Tappan, W.B. 1974. Vegetable weevil: control in cigar-wrapper and flue-cured tobacco plant beds. J. Econ. Ent. 67(5) 699-701.

U.S. Department of Agriculture (USDA). 1990. USDA plant hardiness zone map. USDA-Agricultural Research Service (ARS). Miscellaneous Publication Number 1475. USDA-ARS, Washington, DC 20002

White, I.M. and M.M. Elson-Harris. 1992. Fruit Flies of Economic Significance: Their Identification and Bionomics. CAB. 601 pp.

Wibmer, G.J. and C.W. O'Brien. 1986. Annotated checklist of the weevils (Curculionidae sensu lato) of South America (Coleoptera; Curculionoidea). American Entomological Institute. 563 pp.

WSSA, 1989. Composite List of Weeds. Weed Science Society of America.